Northumberland Sea Fisheries Committee.

1897.

REPORT

ON THE

TRAWLING EXCURSIONS

CARRIED ON

DURING THE SUMMER OF 1897,

AND ON THE

MARINE LABORATORY AT CULLERCOATS,

BY

ALEXANDER MEEK, M.Sc., F.Z.S.,

THE DURHAM COLLEGE OF SCIENCE, NEWCASTLE-ON-TYNE.

Printed by order of the Committee, 21st October, 1897.

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CAIL & SONS, 29 AND 31, QUAYSIDE.

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THE TRAWLING EXCURSIONS.

The trawling excursions were again made in the in-shore waters previously tested, Mr. Dent, as before, generously placing the steamer "Livingstone" at our service. The same trawl was used, though, as has often happened before, the beam had to be replaced once or twice during the season. The excursions, in short, were conducted in parallel with those of previous years, and there is therefore no necessity for repeating here the conditions under which the experiments were made.

In our last year's report the results were stated in a general table for the season, and, in a subsequent paper published in the Journal of the Marine Biological Association, the complete results were given for each bay for all the seasons during which the experiments have been made. In order that members, who may not have seen this paper, may be able to follow the remarks about to be made, these tables are reproduced, and include the results of this year's experiments.

TABLES SHOWING THE NUMBER OF FISH CAPTURED IN EACH BAY.

(1) Blyth Bay. 2-5 Fathoms.

Year.	Date.	Turbot.	Brill.	Sole.	Plaice.	Dab.	Flounder.	Haddock.	Whiting.	Gurnard.	Skate.	Muddy surface temp., F.	Sea.	Wind.
1892...	Aug. 1	—	—	1	88	40	—	—	—	—	—		rough	N.E.
	,, 15	—	—	—	20	12	—	—	—	—	—	—	smooth	W.S.W.
	Sept. 20	2	—	3	60	41	—	—	—	—		—	rough	E.N.E.
1893...	Aug. 2	3	—	56	59	23	—	—	—	—	—	55	smooth	W.N.W.
	Sept. 13	6	—	17	37	19	—	—	—	—	—	56	rough	W.S.W.
1894...	July 27	2	—	43	67	23	2	5	—	41	1	52	smooth	N.E.
1895...	July 31	1	—	12	64	32	—	4	—	25	—	53·5	smooth	calm.
	Aug. 15	4	—	20	58	95	—	7	—	40	—	54	smooth	calm.
1896...	June 18	7	—	5	85	44	—	—	—	46	—	53	smooth	W.N.W.
	Aug. 26	2	—	36	63	78	2	—	—	20	1	55	smooth	E.
1897...	*Aug. 25	2	—	3	55	35	5	—	—	23	—	58	rough	E.

*For 3½ hours only.

(2) Cambois Bay. Depth 3-7 Fathoms.

Year.	Date.	Turbot.	Brill.	Sole.	Plaice.	Dab.	Flounder.	Haddock.	Whiting.	Gurnard.	Skate.	Mid-day surface temp., F.	Sea.	Wind.
1892...	Aug. 11	—	—	—	80	44	—	—	—	—	—	—	smooth	S.W.
	Sept. 13	3	—	7	120	80	—	—	—	—	—	—	smooth	W.
	,, 15	2	—	8	81	47	—	—	—	—	—	—	smooth	W.S.W.
1893 ..	July 15	2	—	3	50	12	—	—	—	—	—	54	strong NE. sea	calm. W.
	Aug. 7	4	—	16	60	51	—	—	—	—	—	55	smooth	
1894..	Aug. 17	1	—	20	18	11	4	20	—	17	—	53	strong	N.
	Sept 13	1	—	59	30	18	—	22	—	6	—	53	surf	N.E.
1895...	July 4	3	—	4	37	13	—	—	—	7	—	52·5	rough	N.E.
	Sept. 5	3	—	4	71	33	—	7	—	85	1	54	smooth	W.
1896...	Aug. 12	8	—	24	76	81	—	—	—	100	—	55	smooth	W.
1897...	July 14	5	—	32	104	73	—	—	—	35	—	54	smooth	N.E.
	*Aug. 25	—	—	15	62	113	—	—	—	23	—	58	rough	E.

*6 to 7 hours only.

(3) Druridge Bay. 2-3 Fathoms.

1892 ..	Sept. 16	—	1	13	140	70	—	—	—	—	—	—	smooth	S.W.
1893...	Aug. 31	9	—	24	87	67	—	—	—	—	4	56	smooth	N.E.
	Sept. 8	7	—	28	73	39	—	—	—	—	—	56	smooth	N.N.E.
1894...	July 4	27	—	5	146	54	3	7	—	—	3	54	smooth	W.
	Aug. 22	7	—	36	50	40	2	24	—	120	—	55	smooth	N.E.
1895...	June 20	5	—	6	120	15	2	—	—	13	2	52	rough	N.E.
	July 11	5	—	12	116	60	—	—	—	35	1	52·5	smooth	W.
	Aug. 22	2	—	11	132	70	—	2	—	120	1	55	smooth	calm.
1896...	July 9	9	—	35	160	68	—	—	—	83	3	54	smooth	S.W.
	,, 29	8	—	8	157	68	1	—	—	143	—	55	rough	E.
	Sept. 8	13	—	26	104	123	1	—	—	124	1	56	smooth	E.
1897...	July 28	22	1	37	129	34	3	—	—	75	—	55·5	smooth	W.
	Sept. 1	19	—	15	102	104	3	—	—	196*	4	55	smooth	S.W.

*The gurnards were all caught by the line, the fish taking the hook very much better than usual. One turbot was actually caught on a gurnard hook on this occasion.

(4) Alnmouth Bay. 2-3 Fathoms.

1893...	July 25	9	—	8	116	100	—	—	—	—	4	54	smooth	N.W.
	Aug. 22	3	—	11	75	49	—	—	—	—	1	55	smooth	S.S.W.
1894...	July 11	17	—	5	131	63	14	2	—	49	3	52	smooth	N.E.
	,, 31	8	—	18	60	51	4	12	—	17	3	54	smooth	calm.
	Aug. 29	14	—	8	65	35	7	15	—	85	2	55·5	smooth	W.
1895...	July 25	7	—	4	118	82	—	10	—	24	—	52	smooth	N.E.
	Aug. 29	3	—	7	101	46	—	103	—	65	1	54	moderate	W.
1896...	July 23	13	—	30	202	117	3	2	1	29	1	55	smooth	W.
	Aug. 19	9	1	9	154	44	3	—	—	46	—	55	smooth	N.
1897...	July 7	6	—	2	58	62	1	—	—	27	2	51	smooth	N.W.
	*Aug. 19	8	—	10	253	43	5	—	—	34	—	56	smooth	W.

*Stopped trawling an hour earlier than usual.

(5) Skate Roads (Budle Bay). 2½-4 Fathoms.

Year.	Date.	Turbot.	Brill.	Sole.	Plaice.	Dab.	Flounder.	Haddock.	Whiting.	Gurnard.	Skate.	Middday surface temp., F.	Sea.	Wind.
1894...	June 27	28	—	1	371	22	19	—	—	—	4	54	smooth	N.E.
	Aug. 6	18	—	1	90	30	9	—	—	51	3	54	smooth	W.S.W.
1895...	June 26	4	—	—	120	42	—	6	—	30	—	53	rough	calm.
	Aug. 5	1	—	3	75	13	—	4	—	70	—	53·5	moderate	N.
1896...	June 24	7	—	5	85	44	—	—	—	46	—	53	smooth	W.N.W.
	Aug. 3	50	1	2	155	10	32	—	—	29	—	55	rough	N.E.
1897...	June 23	44	7	5	111	20	21	—	—	6	8	—	smooth	S.E.
	Aug. 11	33	2	6	138	30	10	—	—	17	1	58	rough	SE to W

The numbers are necessarily fluctuating; and for round fish, indeed, are so varying and inconstant that for the present it will be better to neglect them altogether. Concentrating our attention, then, on the numbers relating to flat fishes, we can see that during the six years in which the experiments have been conducted the returns are fairly constant. It is very difficult to say from a rough inspection of the columns in each table that any decided change has taken place. If the three-mile restriction, which these experiments were primarily meant to test, were having the effect that was anticipated, we should naturally expect a gradual improvement for each class of fish in these waters. I am glad to be able to say that during the last two years an improvement has taken place, but taken separately and together the figures do not show a steady increase, if they do not show a decrease. The bays are slightly improved to-day compared with what they were when the restriction was made: but, considering the seasonal variation already met with, we cannot yet say that the improvement will be continued.

A consideration of each class of fish in each bay will illustrate this. In Blyth Bay, turbot and soles are no more numerous: plaice and dabs show improvement. In Cambois Bay, turbot again are practically steady: soles have increased, and plaice and dabs have lately increased. In Druridge Bay, turbot, plaice and dabs show latterly an increase: soles are pretty much as they were. Almmouth Bay gave us a very poor catch at our first visit this year, but on the second occasion the returns, for plaice especially, showed a marked improvement: the other forms showed the reverse of improvement. Skate Roads give a strong increase in turbot, brill and soles; dabs appear steady, and plaice have decreased.

If we now add together the returns for flat fishes, the value of these experiments may be still more clearly stated.

FLAT FISHES.

Blyth Bay.

1892—August 1	...	129
Sept. 20	...	106
Average	...	118
1893—August 2	...	141
Sept. 13	...	79
Average	...	110
1894—July 27	...	137
		137
1895—July 31	...	109
August 15	...	177
Average	...	143
1896—June 18	...	141
August 26	...	181
Average	...	161
1897—August 25	...	100*
		100

* 3½ hours only.

Druridge Bay.

1892—Sept. 16	...	224
1893—August 31	...	187
Sept. 8	...	147
Average	...	167

Cambois Bay.

1892—August 11	...	124
Sept. 13	...	210
Sept. 15	...	138
Average	...	157
1893—July 15	...	67
August 7	...	131
Average	...	99
1894—August 17	...	54
Sept. 13	...	108
Average	...	81
1895—July 4	...	57
Sept. 5	...	111
Average	...	84
1896—August 12	...	189
		189
1897—July 11	...	214
August 25	...	190
Average	...	202

Alnmouth Bay.

1893—July 25	...	233
August 22	...	138
Average	...	186

Druridge Bay (*continued*).			Alnmouth Bay (*continued*).		
1894—July 4	...	235	1894—July 11	...	230
August 22	...	135	,, 31	...	141
			August 29	...	129
Average	...	185	Average	...	167
1895—June 20	...	148	1895—July 25	...	201
July 11	...	193	August 29	...	157
August 22	...	215			
Average	...	185	Average	...	179
1896—July 9	...	272	1896—July 23	...	365
,, 29	...	242	August 19	..	220
Sept. 8	...	267			
Average	...	260	Average	...	293
1897—July 28	...	226	1897—July 7	...	129
Sept. 1	...	243	August 19	..	319
Average	...	235	Average	...	224

* Trawled less by an hour than usual.

Skate Roads.

1894—June 27	...	441
August 6	...	148
Average	...	295
1895—June 26	...	166
August 5	...	92
Average	...	129
1896—June 24	...	141
August 3	...	250
Average	...	196
1897—June 23	...	208
August 11	...	219
Average	...	214

The above figures show that in Blyth Bay the flat fishes have steadily increased; in Cambois Bay they decreased at first, but in the last two years have increased largely; in Druridge Bay they similarly decreased in 1893, remained steady during 1894 and 1895, and in the last two years have increased; in Alnmouth Bay they have also increased during the last two years; in Skate Roads they were fewer in the second year of the experiments there (1895), and have since steadily increased.

The average return of flat fishes for each year for all the bays is:—

	Blyth Bay.	Cambois Bay.	Druridge Bay.	Alnmouth Bay.	Skate Roads.	Total.	Average.
1892	118	157	224	—	—	499	166
1893	110	99	167	186	—	572	143
1894	137	80	185	167	295	864	173
1895	143	84	185	179	129	720	144
1896	161	189	260	293	196	1099	220
1897	100	202	235	221	214	975	195

These similarly show that during the first four years little change took place, whilst during the last two years a distinct improvement in the number of mature or saleable flat fish has occurred. It may be said that the flat fishes, during the last two years, have increased to the extent of 30 %, compared with the four previous years. This improvement, if continued, will show that the three-mile restriction in this district is conferring an immense benefit, even more than collateral experiments and recent discoveries would lead us to suppose.

These remarks only apply to the fish retained—the saleable fish as they might best be termed. But the fish not retained deserve great consideration as well. We roughly, but still fairly accurately, draft out our catch into two divisions: (1) the fish we have just been considering and (2) the fish which are returned to the sea. This separation of the saleable, and for a great part mature from the small and altogether immature fish, is a very simple process. Those to be retained are picked out from the contents of the net, and the rest are the fish to which I now wish to draw attention.

An attempt was made last year by an instance to give an idea of the size and numbers of such fish. The yearly spawning habits give such contrasts in size that it is possible to pick out the fish with considerable accuracy, and we are thus enabled to say that

those returned to the sea are for the most part in their second season, and include some of the third. Those retained include some of the third season, and all from that age upwards.

In the instance referred to an indication was given of the number of immature fish in one haul at Ahmouth Bay, and commenting on it in my subsequent paper to the Journal of the Marine Biological Association, I pointed out that the immature compared with the saleable flounders were as 100 : 3, that the dabs similarly were as 100 : 50, the plaice as 63 : 100. It thus appeared that the proportion of flounders and dabs in the immature condition was very large, while plaice were actually present in less number in the immature than in the mature condition. I, and everybody associated with me in the work, had the impression, however, that, speaking generally, the immature far exceeded the mature fish in number.

This year, with a view to presenting more definitely the relation between our self-made but satisfactory enough groups, the two classes were counted. At first it was attempted to count the immature at each haul, but latterly it was deemed sufficient to compare the two classes for one haul—usually the first. In this way there was no risk of counting the same fish twice. But the figures got in the beginning of the season showed such variation, as will presently be seen, that the results we have yet got must be looked upon simply as indicating the proportion.

The following table gives the numbers of a detailed examination of the two classes made at Druridge Bay on June 30th.

	Turbot.	Soles.	Dabs.	Plaice.	Gurnards.
Immature (1) ...	—	—	18	24	21
(2) ...	—	—	25	57	12
(3) ...	—	—	12	30	8
(4) ...	—	—	10	20	7
(5) ...	—	—	11	16	16
			76	147	64
Mature—total ...	10	7	82	182	21
Average per haul ..	—	—	16	36	4

The immature at 12 midday, on 28th July, were :—

...	—	...	22	40	26

The mature at the same haul were :—

...	3	... 9	... 4	... 33	... 7

The first haul on September 1st gave :—

Immature—Flounder 1, dabs, 35, plaice 15, gurnards 66.

Mature—Turbot 3, soles 2, flounders 2, dabs 23, plaice 37, gurnards 7.

Ahmouth Bay. 7th July.

	Turbot.	Soles.	Dabs.	Plaice.	Flounders.	Gurnards.	Whiting.
(1)	—	—	24	13	3	70	1
(2)	—	1	26	14	4	57	—
(3)	—	—	28	10	2	137	—
(4)	—	—	30	9	2	not counted	—
(5) Very few young fish.							
Total say	—	1	112	50	11	440	1
Total mature	6	2	62	58	1	27	—
Average per haul	—	—	12	12	—	5	—

Ahmouth Bay. 19th August.

First haul at 11·45 a.m., trawl down 1¼ hours.

	Turbot.	Soles.	Dabs.	Plaice.	Flounders.	Gurnards.
Immature	—	—	9	41	20	30
Mature	2	1	5	50	4	7

Second haul at 1·5 p.m., trawl down 1½ hours.

Immature	—	—	8	70	44	37
Mature	4	2	11	86	5	16

Total immature for two hauls :—

	—	—	17	111	64	67

Total mature for two hauls :—

	6	3	16	136	9	23

Cambois Bay. 14th July.

	Plaice.	Dabs.	Flounders.	Gurnards.
(1)	58	51	3	15
(2)	48	54	5	27
(3)	10	28	—	42
(4)	45	65	1	37
(5)	36	68	5	31
(6)	37	56	2	34
(7)	38	50	4	35
	272	372	20	221
Total mature	104	73	—	35
Average per haul	15	10	—	5

Along with 5 turbot, 32 soles, and 1 thornback.

Blyth Bay. 25th August.

Second haul.

	Plaice.	Dabs.	Flounders.	Gurnards.
Immature	22 ...	22 ...	15 ...	7
Mature, half-total for two hauls	27 ...	17 ...	3 ...	11

At Skate Roads this season the young fish were certainly not so numerous as last year: these were, at both our visits, plaice and dabs. We got several small turbot and brill last year at Skate Roads, and one or two specimens elsewhere. We did not get one this year which could be called distinctly small.

The conditions, then, indicated by our observations for Alnmouth Bay last year are borne out by the more extended observations we have made this year. We find in both cases that plaice are not present in the plainly excessive numbers that the dabs and flounders are, in the small condition. Now it must be more plainly stated, for the sake of my scientific brethren, that the large size of the plaice did not contribute to this result; for, be it remembered, if the large size might have tempted to the over-stepping of the border line between the saleable and the immature, the excessive numbers of plaice compared with the dabs, and their often general large size, would tend to counterbalance this. Not only so, but our general impression and many more cases of counting and general note-taking were leading us to the opinion stated above—that, as a rule, the plaice are not usually predominant in the young condition. The mature plaice present in these bays, then, cannot be looked upon as the survivors of the younger inhabitants, as may more easily be supposed to be the case in regard to the others. This, and the large size of the fish, are quite convincing proofs that plaice do not go further out as they get older and larger, but show that our in-shore waters receive a large quantity of fish from the outside as well. Plaice that have spawned and re-spawned outside these in-shore waters are quite common in the bays, examples over 15, 16 and 17 inches being constantly met with, and not very seldom over 20 inches as well. At Skate Roads, one measured 25 inches by 15 inches; at Druridge Bay, 22 inches by 13 inches was recorded, and so on,[1] and the fish were in capital condition.

[1] The following occurs in my diary for Druridge Bay excursion on 1st September:—"The plaice were *all* splendid, large fish, many measuring 18 inches, and over; 19½ inches and 19¾ inches were measured."

A very general impression among naturalists is that the plaice is only in-shore in its young condition, and that the larger specimens are almost completely confined to off-shore grounds, that when the larger ones come in-shore they are more or less diseased; but the results we have obtained during these two seasons show that for our coast such a statement is not true. Very large plaice occur in relatively large numbers, and in a perfectly healthy condition. Whether this result is to be correlated with the very encouraging improvement in the numbers of the saleable fish observed during these two seasons has still to be shown, but we are justified in saying, at any rate, that as far as plaice, soles, turbot and brill are concerned, we receive in these in-shore waters a return of fish which have spawned off-shore. I do not mean to say that all plaice, for instance, that go out to spawn, return, or would return; experiments made by marking fish showing that they often find their way to a considerable distance. Moreover, these larger fish will draw off when the rougher, colder weather sets in, but that they do come into protected waters even for a season is a matter of great importance.

A large number of fish were again measured and examined as to food and the condition of the generative organs, but it is not necessary to give the results in detail.

Plaice were measured from 11 inches to 25 inches in length, the most mature being found from 15 inches onwards, and were found to be feeding, as last year, on *Donax trunculus* and *Tellina tenuis*, but the latter were more commonly got than last year. The food observed in three of the specimens was (1) a great quantity of *Amphipods*, (2) a piece of *Solen* and (3) *Annelids*.

Dabs (9 inches to 12¼ inches) were often got immature, or apparently so, up to 12 inches, and were feeding, as last season, on *Portunus holsatus*. *Solen* was observed in several cases, *Annelids* were present in a few, and a large *Idotea tricuspidata* was found in the intestine of one which had afterwards partaken of a *P. holsatus*.

Flounders (10 inches to 18½ inches) were feeding principally on *Tellina tenuis*. On the same day as that found in the case of one plaice, three flounders examined had similarly fed on a large quantity of *Amphipods*, evidently taken from macerated wood.

Turbot (12½ inches to 22½ inches) included forms with eggs visible, of 13, 14½, 16, 21 inches, &c., but again immature females were got—I have called them immature in such cases that I could

not find opaque ova—measuring 13, 14¼, 14½ and 15 inches. Some of the mature forms got in June were almost ripe, and when the ova were put into water they floated up. They were feeding on sand-eels and, latterly, whitings; in one case *Annelids* were found.

Soles (11 inches to 18½ inches) were got mature, measuring 12½ × 5½, 15 × 6¼, 15 × 6½, 15½ × 6½, 16 × 6, 16 × 7, 17 × 7½, 17½ × 8 and 18 × 8 inches, and immature 10½ × 4¼, 11 × 4, 11½ × 4½ and 11½ × 5 inches. They were feeding on sand-eels and *Annelids*.

Gurnards were found mature at 11, 11½ and 12 inches, and all above these sizes were mature, and in the earlier part of the season especially were got full of spawn, and ripe. The ovaries were used, as in the case of the turbot, to demonstrate to the company on the steamer the artificial fertilization of the ova, and the fact that they float. The ova, besides, were found at the same time in both surface and mid-water nets. They were feeding on sand-eels, *Portunus holsatus* and shrimps.

Thornbacks, measuring across the pectorals—

19 inches,	14 inches	(Skate Roads)
13½ ,,	12¼ ,,	(Ahmonith Bay)
14½ ,,	15½ ,,	(Druridge Bay)

were feeding on *P. holsatus*.

Anglers were feeding usually on weevers, but in one instance a 2-inch plaice was got, in another a 6-inch plaice, and in still another a 6-inch dab.

The Codlings caught in Druridge Bay were both immature, and were feeding on sand-eels: one of them had also a dab, measuring 4¼ × 2⅝ inches.

PELAGIC EGGS.

Last year two kinds of eggs were got in the surface net, those of the weever (*Trachinus vipera*) and an unknown kind, which was said to be similar to the "F" form described by McIntosh and Prince. Mr. Holt now believes that he has proved the latter, as Prof. McIntosh had suggested, to be the egg of a topknot, viz., Müller's Topknot *Phyrnorhombus unimaculatus* (*Risso*). This form is very rare, but it no doubt occurs on this coast. Mr. Howse only mentions, and refers to this species, a small specimen got at Cullercoats in 1830 by Albany Hancock. It will be seen from the

report on the Laboratory that a Bloch's Topknot was obtained this year off Dunstanborough. Both of these eggs were very common this season.

Besides the surface net, we used another attached to the beam of the trawl, and thus obtained eggs and other products from about 4 feet from the ground upwards. With this net we obtained, in the earlier part of our summer work, a very large quantity of floating eggs. The eggs will, of course, tend to float in the region of water which is of the same density as they are themselves, and as they are driven shorewards and the embryo develops, and their specific gravity increases, they sink down from the surface. This is naturally of great importance for their preservation. The sinking of the eggs, however, is not always due to the development of the embryo. The ova vary in density, for many eggs were got in the bottom net even younger than those got at the same time in the surface net. The descent of the eggs is aided also, most probably, by the in-shore water being of less density than that further out, and on the surface than that nearer the bottom.

WEEVER.

June 23 ...	Skate Roads ...	Surface ...	A few.
,, 30 ...	Druridge Bay ...	,, ...	Common.
,, 30 ...	,, ...	Midwater..	Numerous.
July 7 ...	Ahmouth Bay...	Surface ...	Fairly common.
,, 7 ...	,, ...	Midwater..	Common.
,, 14 ...	Cambois Bay ...	Surface ...	,,
,, 14 ...	,, ...	Midwater..	,,

UNKNOWN EGG.—Perhaps that of MÜLLER'S TOPKNOT.*

June 23 ...	Skate Roads ...	Surface ...	Only 1 or 2.
,, 30 ...	Druridge Bay ...	,, ...	Several.
,, 30 ...	,, ...	Midwater..	Common.
July 7 ...	Ahmouth Bay...	Surface ...	Fairly common.
,, 7 ...	,, ...	Midwater..	Common.
,, 14 ...	Cambois Bay ...	Surface ...	,,
Aug. 21 ...	2/3 miles off Blyth	...	One.
Sept. 11 ...	Cambois Bay ...	...	One, dead.

* It is very probable that some of these will turn out to be the eggs of Motella.

DAB.

June 30 ...	Druridge Bay ...	Midwater..	Common.
July 14 ...	Cambois Bay ...	,, ...	Fairly common.
Aug. 21 ...	2/3 miles off Blyth	Surface ...	One, dead.
,, 21 ...	,, ,, ...	Midwater..	One.

GURNARD.

June 30 ...	Druridge Bay ...	Surface ...	One.
,, 30 ...	,, ...	Midwater..	Numerous.
July 7 ...	Alnmouth Bay...	Surface ...	Fairly common.
,, 7 ...	,, ...	Midwater..	Common.
,, 14 ...	Cambois Bay ...	Surface ...	1 or 2.
,, 14 ...	,, ...	Midwater..	Common.
,, 28 ...	Druridge Bay ...	Surface ...	A few.
,, 28 ...	,, ...	Midwater..	,,

It is only necessary to say in regard to the preceding tabulated statements of the pelagic eggs taken this year, that we add the dab and the gurnard to the forms previously recorded as spawning in-shore on this part of the coast. It will be seen that all had practically disappeared before the end of July.

Two eggs of the whiting were obtained in the mid-water net at Druridge Bay on June 20th. These, and that of the sole found in Cullercoats Bay, on the 22nd July, must be looked upon as stray specimens, which have had time to be brought into in-shore waters before hatching. But it ought to be mentioned that all the eggs, practically, were got quite close to the shore—at least as close as is practicable with a steamer. Attempts made late in the season, farther out, gave us no new eggs; we have only to satisfy ourselves by a few trials with the surface and mid-water nets in the earlier months of the year, inside and outside the three-mile limit, to be able to report on the possibilities of the in-shore waters with regard to spawning. There is, however, little likelihood that we shall be able to add much to the list now given of the fishes which spawn within the limit. We are, therefore, still obliged to recognise that outside the limit the most valuable fishes are liable to destruction at the time of their spawning migration—and this is just the time when their preservation is most desired. This destruction, as I reported to the N.E. District some time ago, "cannot be controlled at present, for the reason that it occurs outside the area of jurisdiction, and also because the currents which carry the spawn bring it

often from grounds over which the district concerned has no control. It might be made plain, however, that the three-mile limit, as a protection to spawn, and more especially to spawning fish, is of very little service. Districts, for one thing, should have at least a wider area of jurisdiction, and, once the near spawning grounds can be specified, prohibition during the spawning season would, we feel certain, be of much benefit as regards the in-shore region. At the same time, artificially fertilized eggs could be added to the sea at such places, and a better hatching and rearing ground than the open sea it would be difficult to get."

OTHER FISH.

Our records show that haddock were never got this year. Whiting were only observed in the stomach of the turbot at the end of the season, and an immature specimen was got in the trawl. Thornback skate were got—see returns—on several occasions. Anglers were common in all the bays. The dog fish (*Acanthias*) was not got at all this season. A lemon dab, or lemon sole as it is usually called (*Pleuronectes microcephalus*), was obtained in Cambois Bay, where a single specimen was also obtained last year. The lesser weever was got in the trawl once or twice; the great weever once, on the 19th August, and it was kept alive in the Laboratory until the 7th October, when it managed to jump out of the tank, and was consequently found dead. A large cat fish (3 ft.) was caught in our last haul at Cambois Bay on the 14th July.

Abnormal Fish.—At Skate Roads, on the 11th August, a turbot was got almost entirely pigmented on the under side. A flounder, $14\frac{1}{2} \times 8\frac{1}{2}$ inches, had the eyes on the left side, instead of the right. Several of the anglers were found with tumours in the stomach containing nematodes. A plaice obtained in Cambois Bay, on the 2nd August, was pigmented on the under side in exact imitation of the upper side; about one-half (the caudal end) was thus coloured, nearly the whole of the ventral (anal) fin, a great part of the dorsal fin, a blotch extended up from the left pelvic fin, and several isolated round areas occurred as well.

The invertebrate forms got by the trawl, worth mentioning, are the great quantity of heart urchins (*Spatangus purpureus*) got dead at Ahmouth Bay on 7th July, in every haul of the trawl, and again in much less quantity at Cambois Bay, on 11th July; *Mactra stultorum*, *Cyprina islandica*, occasionally; *Donax trunculus*, in the dredge used to take up a sample of the bottom; *Hyas araneus*

(Almouth, 7th July), *Hyas coarctatus*, *Eupagurus bernhardus*, several; *Limnoria lignorum*, in a piece of wreckage (oak); *Porcellana longicornis*, numerous; *Galathea squamifera* jv; *Cyanea* and *Aurelia*, often very common; *Lutraria elliptica*, *Solen siliqua*. *Portunus holsatus* was pretty common in the trawl all the season. The females were often got up to the middle of August, berried. On the 19th August and afterwards it was rare to get a berried *Portunus holsatus*, even among hundreds. The majority after this date were soft, and casting – many being found just ready for casting.

The surface and mid-water life included several young rocklings and lumpsuckers, and a young goby, as well as invertebrate forms of great interest.

THE MARINE LABORATORY AT CULLERCOATS.

I have much pleasure in submitting a first report on the laboratory and the work we have so far been enabled to accomplish. In doing so, I cannot help saying, in a word, that this Committee, the College of Science, and all who have an interest in our fisheries or a love for marine zoology, can never adequately thank Mr. Dent for his gift to the district. He has for many years, as you well know, strongly identified himself with fishery questions, and his earlier efforts are now yielding the important information which I have just had the honour of laying before you. That this work should be still further successful, that a centre should be formed for local fishery research, that this district should have an opportunity of joining in general marine natural history, has long been Mr. Dent's desire.

This desire led to certain preliminary interviews and enquiries, which finally resolved themselves into selecting a site. We determined upon Cullercoats—a place already famous in the annals of natural history as the scene of much of the work done by many of our well-known local naturalists. An arrangement was made for a site beside the baths there, and a supply of sea water. The building erected is a small one, measuring 30 feet × 10 feet, and the tanks which have been fitted up are made to occupy a 10 feet × 10 feet space, thus leaving 20 feet × 10 feet as a workroom. These tanks are (1) a storage tank, measuring 7 × 3 feet and 25 inches deep; (2) four tanks, measuring 4 × 3 feet and 12 inches deep, one of which has one of the sides made of glass; (3) a large tank, 6 × 3 feet and 25 inches deep.

The top tank is fitted with a tap by which the supply of water through the rest can be regulated, and the other tanks simply pour into one another in succession through tubes of bamboo. Each, however, is provided with a sand trap, such as has been recommended by Prof. Herdman, and thus they can be used not only for general zoological work, but for the investigation of the development of fish and other forms, without danger of the contents of one tank, however minute, being carried over into the next. The lower, large tank was so made for two reasons, (1) that a sufficient

depth of water could be got for certain forms of life, and (2) that we could, if we required, by attaching a pump or endless chain of buckets, recirculate the water through the tanks. The necessity for this, however, has not arisen, but we may find it convenient at some future time to introduce a means of forcing air into the water. In addition to these tanks, a number of large glass cylinders are supplied with water in a similar manner. The water and the tanks have now been fairly well tested. Mr. Storey has kept almost a daily record of the temperature of the water and of the air in the tank end of the room, and it shows that it will suit most purposes very well. The water is obtained from between the piers, near the entrance of the harbour, when the tide is in. I found at first that the water was alarmingly warm, and appealing to Mr. Small, the owner of the baths, who has been most kind and obliging, I found that we had been getting the first supply of the tide, which, of course, was greatly warmed as it came lapping over the warm sand. However, since our supply has been postponed until there is a good depth of water over the inlet pipe, the temperature has been much better, and we have often recorded a lower temperature than that of the surface water at our trawling excursions. With some care, then, to see that the water is kept running, and to pick out any material which might contaminate it, the tanks will be found most useful for making experiments on the development of fishes, and for studying the habits of marine animals.

The laboratory will accommodate several workers. It is supplied with bottles and tubes, and the ordinary preserving, staining and mounting reagents. For small specimens we have a good supply of tubes and bottles of the size suggested by Canon Norman, so that we may in time arrange them easily in cabinets. But our larger specimens have as yet to be placed in any kind of bottle. Some of them deserve a better fate. Such bottles, however, if they have wide mouths and are fitted with tight stoppers, are very useful for general storage. We are indebted for these to several friends. Our museum, then, is not to be judged from the style of bottle.

For transparent and coloured specimens we have used formalin as a preservative with much success, and I should draw your attention particularly to the medusoids, ctenophors, jelly fish and fish eggs preserved in this manner. That our collections are already rich in some things may be gathered from the fact that the Hancock Museum has already gained slightly, and will still further gain, from the specimens we have already collected.

I may now refer briefly to the work we have tried to do so far. It has simply been making a survey of the ground. Our trawling excursions have furnished many interesting specimens, and we have explored the rocks and pools which lie so conveniently near the laboratory. I need not tell you of the finds, but I should like to mention that during the spring tides of September we saw, in company with *Mysis chamæleon*, near the rocks which fringe the mouth of the harbour, the two spotted goby (*Gobius Ruthensparri*). It was recorded for Berwick by Dr. Johnston, but Mr. R. Howse had no other local record of it when he compiled his catalogue of local fishes.

The shanny (*Blennius pholis*) is similarly common in the young condition in the upper pools of these rocks. Dr. Johnson had again recorded it for Berwick, and this is the only local mention of it. On the 28th September, on the south side of the Bear's Back Rock, several specimens of Montagu's sucker (*Liparis Montagui*) were obtained by Mr. Storey. This is recorded for the first time for the district.

On the 22nd July we got the loan of a small boat and tried our surface nets outside the harbour. In a very short time we got several eggs of the weever, the dab, the "F" form mentioned in the report of the trawling excursions, and one which appeared to be that of a sole.

Through the fishery officer we have besides obtained many specimens from the trawlers at Shields. I should like to mention among these (1) a Bloch's topknot (*Phyrnorhombus punctatus*), caught some 6 miles off Dunstanborough; (2) a young variegated sole (*Solea variegata*), from 45 miles E.N.E. of the Tyne; (3) a small starry ray (*Raia radiata*), from 6 miles off Blyth.

Among the zoophyte material (mainly *Hydrallmania falcata*, *Sertularia abietina*, *S. fulicula*) which is gathered up in large quantity in the net of the trawl, we occasionally got a good deal of herring spawn. From this we were able to hatch the embryo herring. It must be observed, however, that the quantity thus got by the trawlers must be very small compared with what the haddocks destroy. The haddocks caught on this ground, and they congregate there in immense numbers, feed on nothing else, as we can show in the specimens we have preserved. It is, of course, during their spawning migration that the herring are exposed to a great deal of destruction. Between persistent fishing and the destruction of the eggs which has been pointed out, it is a wonder that they keep up

in numbers so well. And though the catch during the last two seasons has shown a large decrease, we would not yet be justified in saying that the herring fishing is being seriously affected.

We are indebted to Major Brown, who owns the shell-fish farm at Budle Bay, for collections received per Mr. King, (*a*) of oysters, including a series of shells representing the extinct oyster of that region, and examples of various varieties of the valuable bivalve—some of these are still living in one of the tanks; (*b*) of mussels at different stages of growth, and showing the result of different conditions in influencing the growth. This latter collection I hope, on a subsequent occasion, to make the basis of a communication on the important bait question.

We have to thank Mr. J. Douglas, Beadnell, Chathill, for two "berried hen" lobsters, received on the 23rd August—one recently spawned, the other nearly hatched out. After and during the process of hatching the latter got rather weak, and died during the night of the 26th-27th. The former is still alive in our large tank.

Mr. R. Howse, M.A., the curator of the Hancock Museum, worked for some time in the laboratory during September. He kindly named our collection of mollusca, and is to prepare a report on that group from our collection. I hope that Dr. Brady will report on the group which has made his name so well known in the zoological world. The Alder scholar of the College, Mr. Young, is to devote some of his time to general collecting and work.

We are thus making an examination of the ground close at hand, and by means of the fishery officer's visits to Shields we obtain material from off-shore grounds, and often from considerable distances. We have, indeed, excellent opportunities for making a collection, but a display cannot be expected until we have suitable jars to contain the specimens.

I take this opportunity of pointing out—I hope I shall not be misunderstood in my desire to make the laboratory more and more complete—that far more necessary even than specimen jars, are books—books of reference. It is strange, considering the large share which has been, and is still, taken by this district in the study of natural history, the paucity of really good literature on the subject in all our Newcastle libraries. That part of the College library, for instance, with the exception of the Challenger Reports, might with much truth be declared to be non-existent. But what we want here is not a biological library—the College is the place for that—but such monographs and books as refer to marine work.

I hope, also, soon to find that the laboratory will be provided with a microtome and the accessories for carrying out minute investigation into structure.

It will be desirable in the coming spawning season to get some surface and mid-water netting done. I am sure that Mr. Dent would consent to the "Livingstone's" being used for that purpose, and Mr. Storey is willing, should the Committee sanction it, to go out now and then with a trawler for a similar purpose. Much important knowledge in regard to the spawning habits of the fishes and material for illustrating development would be obtained in this way. The fishery officer might find time, moreover, to make local hauls with nets if a boat were at the disposal of the laboratory.

I mention these to show what possible developments might take place. We are willing to do our best with the material and apparatus at present at our disposal, but we cannot help desiring that our means of getting material, of investigating and of preserving it, should be increased.

I should only like, in conclusion, to point out that the fishermen of the district are invited to avail themselves of the laboratory by bringing descriptions of phenomena they may have observed and specimens they do not understand, and we shall do our best to explain to them their nature and importance. They are more than welcome to come and see the work we are doing, the embryo fish which we have managed to hatch from the egg, and many another interesting sight to fishermen, and they will, I am sure, join with us in saying that we are making an honest attempt to understand, and to make understood, the local fisheries and the conditions which influence them.